LIGHT-EMITTING DEVICE AND ELECTRONIC DEVICE USING LIGHT-EMITTING DEVICE

TECHNICAL FIELD

[0001] One embodiment of the present invention relates to a light-emitting device utilizing electroluminescence. Further, an embodiment of the present invention relates to an electronic device using the light-emitting device.

BACKGROUND ART

[0002] In recent years, research and development have been extensively conducted on light-emitting elements using electroluminescence (EL). In a basic structure of such a light-emitting element, a layer containing a light-emitting substance is provided between a pair of electrodes. By applying voltage to this element, light emission can be obtained from the light-emitting substance.

[0003] Since the above light-emitting element is a self-luminous type, a light-emitting device using this light-emitting element has advantages such as high visibility, no necessity of a backlight, low power consumption, and the like. Further, such a light-emitting element also has advantages in that the element can be formed to be thin and lightweight and that response time is high.

[0004] The light-emitting device having the light-emitting element can have flexibility and impact resistance in addition to its thinness and lightness and thus has been expected to be applied to a flexible substrate. The light-emitting element is applied not only to the light-emitting device but also to a semiconductor device or the like which functions by utilizing semiconductor characteristics.

[0005] As a method for manufacturing semiconductor device using a flexible substrate, a technique in which after a semiconductor element such as a thin film transistor is formed over a base material such as a glass substrate or a quartz substrate, the semiconductor element is transposed from the base material to another base material (for example, a flexible base material) has developed. In order to transpose the semiconductor element to another base material, a step for separating the semiconductor element from the base material that is used for forming the semiconductor element is necessary.

[0006] For example, Patent Document 1 discloses a separation technique using laser ablation, which is described below. A separation layer formed of amorphous silicon or the like is formed over a substrate, a layer to be separated which is formed of a thin film element is formed over the separation layer, and the layer to be separated is bonded to an object to which the layer to be separated is transposed by a bonding layer. The separation layer is ablated by laser light irradiation, so that separation of the separation layer is generated.

[0007] In addition, Patent Document 2 discloses a technique in which separation is conducted by physical force such as human hands. In Patent Document 2, a metal layer is formed between a substrate and an oxide layer and separation is generated at an interface between the oxide layer and the metal layer by utilizing weak bonding between the oxide layer and the metal layer at the interface, so that a layer to be separated and the substrate are separated from each other.

[0008] In Patent Document 2, an interlayer insulating film is formed over the light-emitting element including an anode, an organic light-emitting layer, and a cathode, and the interlayer insulating film is bonded to a supporting member using a bonding layer. Then, separation is performed at the interface between the oxide layer and the metal layer, and the layer to be separated including the light-emitting element is bonded to a film substrate using the bonding layer, so that a light-emitting device using a flexible substrate is manufactured.

REFERENCE

Patent Documents

[0009] [Patent Document 1] Japanese Published Patent Application No. H10-125931

[0010] [Patent Document 2] Japanese Published Patent Application No. 2003-174153

DISCLOSURE OF INVENTION

[0011] Here, the light-emitting element formed in the layer to be separated has a structure in which a light-emitting layer is provided between a pair of electrodes. In the case where an organic compound is used for the light-emitting layer, adhesion between the light-emitting layer and an electrode which is a cathode or an anode formed in contact with the light-emitting layer is low. In the case where the adhesion between the light-emitting layer and the electrode is low, the separation may occur at the interface between the light-emitting layer and the electrode when the separation layer is separated from the layer to be separated by physical force.

[0012] In addition, in the case of a light-emitting device using a flexible substrate, there is a possibility that separation may occur at the interface between the light-emitting layer and the electrode, and the light-emitting element may be damaged when physical force such as bending or curving is externally applied.

[0013] In view of the above problems, an object of one embodiment of the disclosed invention in this specification and the like is to provide a highly reliable light-emitting device in which a light-emitting element is prevented from being damaged when external physical force is applied.

[0014] One embodiment of the present invention is a light-emitting device which includes a light-emitting element formed over a first substrate, including a first electrode layer, a light-emitting layer, and a second electrode layer; a structure body formed over the first substrate; a second substrate provided to face the first substrate; and a bonding layer provided between the first substrate and the second substrate. The light-emitting layer is separated by the structure body. By strengthening adhesion between the structure body and the bonding layer or between the structure body and the second electrode, a highly reliable light-emitting device in which the light-emitting element is prevented from being damaged can be provided. Detail thereof is described below.

[0015] One embodiment of the present invention is a light-emitting device which includes a light-emitting element formed over a first substrate, including a first electrode layer, a light-emitting layer formed in contact with the first electrode layer, and a second electrode layer formed in contact with the light-emitting layer; a structure body formed over the first substrate; a second substrate provided to face the first substrate; and a bonding layer provided between the first substrate and the second substrate. The light-emitting layer is separated by the structure body, and at least a part of the structure body is in contact with the bonding layer.

[0016] One embodiment of the present invention is a light-emitting device which includes a light-emitting element formed over a first substrate, including a first electrode layer,